SPM-32A ... SPM-36A
Selective Level Meters

Operating Manual

BN 4033/00.82

ACTERNA™
The Keepers of Communications

SPM-32A ... SPM-36A
Selective Level Meters

Operating Manual

SPM-32A, BN 4033/11:
50 Hz to 620 kHz, Series O ...

SPM-33A, BN 4033/01:
50 Hz to 2 MHz, Series O ...

SPM-34A, BN 4033/20:
50 Hz to 2 MHz, Series O ...

SPM-35A, BN 4033/30:
50 Hz to 2 MHz, Series Z ...

SPM-36A, BN 4033/36:
50 Hz to 3.5 MHz, Series AG ...

ACTERNA™
The Keepers of Communications

Please direct all enquiries to your local Acterna sales company. The addresses are given at the end of this handbook.

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Edition: 02/ 02.08.02 O ..., Z ..., AG ...

Note: Specifications, terms and conditions are subject to change without prior notice.

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Contents

1 FOREWORD

1.1 About these instruments

The **SPM-32A, 33A, 36A** series of Selective Level Meters are designed as in-service test sets for CF communications systems using up to 120, 300 or 600 channels respectively.

The **SPM-34A** Selective Level Meter is particularly suitable for making level measurements on instruments and equipment used in telex and telecontrol systems as well as in telephony. Four bandwidths are specially tailored for making in-service measurements on ITU-T FM VFT channels with transmission rates of 50, 100, 200 and 600 Baud.

The **SPM-35A** Selective Level Meter is suitable for analyzing a mixture of frequencies and for measurements on ARI and RDS systems, as well as telecontrol and ITU-T FM VFT systems operating at 50, 100 and 200 Baud. The minimum bandwidth of 5 Hz is useful for measuring discrete signals starting at 50 Hz (e.g. subaudio tones) and composite signals, such as spectral components of analog (ARI) and digital (RDS) traffic radio signals in the multiplex baseband of UHF transmitters. These signals are located close to the 57 kHz auxiliary carrier. The 25 Hz bandwidth is suitable for easurement of pilots and residual carriers. Special bandwidths for keyed signals make the instrument optimal for in-service measurements on FM-VFt and remote control systems.

When combined with the PS-33A Level Generator (2 MHz), each of the instruments forms a complete test setup for measuring level , gain and attenuation.

The built-in synthesizer and 1 Hz frequency resolution allow accurate, stable frequency settings across the entire range. This greatly simplifies tuning to pilots using a narrow resolution bandwidth. The instrument key with user-selectable stepsize is useful for measurements on evenly spaced channels. Fixed frequencies such as pilots can be stored in memory to speed up routine tests.

The digital display indicates absolute and relative level with 0.01 dB resolution, allowing measurement of very small level differences. The fast bargraph is very useful for alignment work.

A demodulator with an integral loudspeaker can be used to monitor the input signal.

The current result is also stored when the setup is stored; the memory can be used as an electronic notebook up to 100 results.

The display provides a quick overview of all functions currently in use. Other functions such as frequency scan, AFC, demodulation, setups and storage of fixed frequencies contribute to fast and error-free test procedures.

The instrument is ideal for field applications (e.g. in service testing, maintenance) due to its simple operation, wide temperature range, rugged design and flexible powering options (a.c. line or batteries). Using the BAZ-33 Battery Pack (accessory), the level meters can be operated for 8 hours from battery power.

1.2 About this handbook

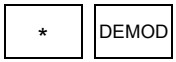
Textual conventions

All instruments in the SPM-33 family are described in this handbook. Where the instruments differ, this is indicated by an appropriate fotnote or by the instrument name in the subheading.

Keypad operation

To use the functions in yellow, press the yellow key with the asterisks beforehand.

Example:

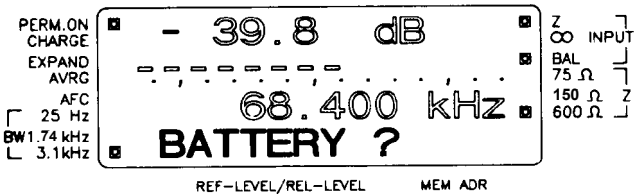


"MAX:HOLD": Display of the highest RMS value which occurs during the observation time interval (for use with fluctuating signals).

Graphic conventions

The display illustrations have been generated using a computer and all essential features of the display are shown. The part of the display referred to in the text is, however, shown in bold characters for the sake of clarity. The actual display does not, of course, make these distinctions.

Example: in this figure "BATTERY?" is written in bold script as this aspect of the instrument is being discussed.



2 Safety information

Before connecting up

The instruments left the factory in perfect condition. To ensure correct and safe operation, please read the following information before using the equipment.

Correct usage

The instruments may only be used under the conditions and for the purposes for which they are intended. In this regard please note the information contained in Section 1 (Foreword) and Section 5 (Specifications).

Pay attention to max. input voltages (see section 4.2.2).

Safety information for operation in a telephone network

This device is designed for use on telephone lines. It complies with safety norm EN 41003. In this context, the LNT-2 charger unit is required for a.c. line operation.
This assures that electrical circuits connected to the telephone network are not exposed.

Safety information: LNT-2 AC Adapter/Charger Unit

AC line voltage	Before use, make sure that the operating voltage of the LNT-2 and the local AC power supply voltage are the same.
Fuse	The excess-temperature fuse built into the device does not depend on the a.c. line voltage setting. It is not necessary to check or exchange this a.c. line fuse.
Safety class	The LNT-2 is a safety class II equipment to IEC 1010-1 (VDE 0411 and IEC Publ. 348).
Faults or damage	If it is thought that the instrument is no longer safe to operate, the LNT-2 should be disabled and secured against unintentional operation.
Repairs	Repairs must be correctly made. In particular, the construction characteristics of the LNT-2 must not be altered in any way which may be detrimental to the safety of the equipment. This applies particularly to creepage and air paths. Before opening the LNT-2, disconnect it from all power sources.

Spare parts	Only original spare parts should be used. Spare parts from other sources may be used only if their use does not adversely affect the safety of the LNT-2.
Temperature	The LNT-2 is intended for use indoors and can be operated at temperatures between 0 and + 50 °C.
Ventilation	When the LNT-2 is in use it should be placed such as to ensure adequate ventilation.
Condensation	The LNT-2 must not be operated if condensation has formed on it. If condensation is unavoidable, as when the cold LNT-2 is brought into a warm room, it must be allowed to dry out before being switched on.

Notes:

3 GENERAL INFORMATION FOR THE USER

3.1 Display contrast

Similar to modern pocket calculators, these instruments have an LCD display. The display contrast depends on:

– the light incident on the display
– the viewing angle

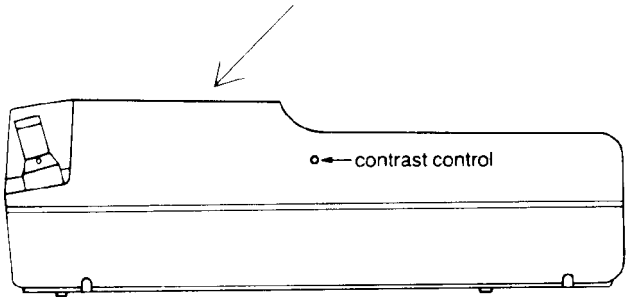


Fig. 3-1 Normal viewing angle. The contrast can be adjusted by means of the contrast control (in hole in side of set).

If you are viewing the instrument at a different angle, adjust the contrast accordingly.

You will find the contrast control in the hole in the lefthand side of the set. You can adjust the control with a thin screwdriver. Set the contrast so that

– the lettering is clear and
– the background grid can scarcely be seen

3.2 Power supplies

The instruments can use one of four types of power supply:

– an a.c. adapter/charger
– two 9 V dry batteries
– two rechargeable batteries (NiMH)
– the BAZ-33 battery pack. Note the operating instructions for the BAZ-33 battery pack.

3.2.1 AC line power

The **LNT-2 AC Adapter/Charger Unit, BN 2071/90.02**[1] is designated for powering the instrument from the a.c.line.

- Plug the charger cable jack into the socket on the right-hand side of the instrument.
- If batteries or NiMHs are fitted, plugging and unplugging the charger cable will not interrupt the power supply to the unit. Power will always be drawn from the a.c. adapter/ charger when it is plugged into the instrument.

1 see section 2: Safety information

- Even if you only intend to operate the instrument from the a.c. line power supply, batteries or NiMHs should be fitted to prevent loss of stored data in the event of a power supply failure.

If no batteries are fitted, or if the batteries are flat, the "BATTERY?" warning message will be displayed even if the instrument is connected to the a.c. adapter/charger (see section “Low batteries“).

- The auto-off circuit which normally operates after 15 minutes when batteries are used is disabled when theinstrument is operated from an a.c. adapter/charger. (see section 3.3 on page 3-10).

3.2.2 Battery power

Two 9 V dry batteries or two rechargeable batteries are required. The following are suitable:

– Manganese/alkaline batteries (IEC 6LF22 or 6LR61); these give an operating time of about 8 hours, or

– Rechargeable NiMH batteries (same size as 6LF22); these give an operating time of about 2 hours.

  Acterna supply suitable rechargeable batteries, see accessories (Specifications).

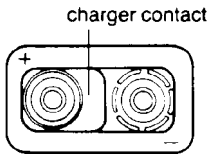


Fig. 3-2 Terminals of 9 V rechargeable battery with charger contact

Low batteries

If the batteries are low,

– "BATTERY?" is displayed, and
– the instrument is switched off automatically after a few minutes.

The built-in lithium battery ensures that the memory contents are retained.

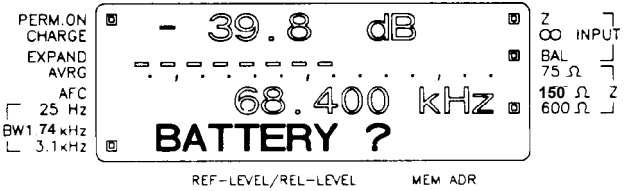


Fig. 3-3 Battery low warning

- The battery low warning "BATTERY?" is temporarily cleared when you press a function key. It will however reappear after about a minute because the battery voltage is measured at one-minute intervals.
- The warning will also be displayed when the instrument is powered by the AC adapter and there are no batteries in the set.

Changing the batteries

Warning: Do not charges the batteries or NiMH cells with the instrument switched on. The memory contents can be lost if you do this.

The batteries are changed in the following way:

- Switch off the instrument.

  The built-in lithium battery ensures that the memory contents are retained when the instrument is switched off.
- Turn the instrument so that the back panel faces upward
- Use a coin or a screwdriver to turn the screw locking the battery compartment (counterclockwise) and remove the cover.
- Holding the instrument in one hand shake out the batteries into your other hand taking care not to disconnect them.
- Replace one battery at a time so that you do not lose any data which you may have stored.

  The instrument will not be damaged if you try to connect a battery the wrong way round.

- Replace the new batteries as shown in the diagram below. The flat cable must be below the batteries and must not be twisted.

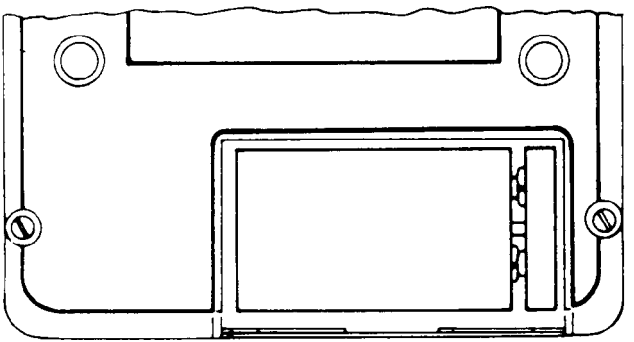


Fig. 3-4 How to replace the batteries in the battery compartment.

- Replace and press down the cover while using a coin or a screwdriver to turn the screw clockwise.

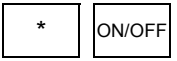
  If the lid does not fit properly, do not use force, the flat cable under the batteries may be twisted.

Charging the batteries

When the AC adapter is connected, the rechargeable batteries are trickle-charged.

If the warning "BATTERY?" is displayed, it is necessary to charge the batteries.

- Connect the AC adapter
- Set the instrument to PERM ON mode (no auto-off)



PERM.ON

- Select the charge mode by entering the following keystrokes:

CHARGE

"PERM.ON" and "CHARGE" should now appear in the display.

If the AC line voltage is too low, the warning "LINE POWER?" is displayed. This warning disappears within 1 minute when the correct AC line voltage is applied.

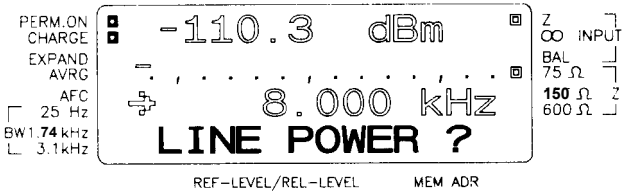


Fig. 3-5 Instrument set to charge mode, but AC line voltage missing.

- Charging is timed and takes 14 hours
- You can make measurements while the batteries are being charged.
- If there are dry batteries in the instrument, and you select charge mode, the instrument will confirm that charge mode has been selected but the batteries will not be charged as they do not have a charger contact.
- The charge cycle is terminated if the AC line voltage fails.

Note: If the LNT-2 AC adapter/charger is connected, a charging current will flow which is sufficient to compensate for the self-discharge of the NiMH cells. To ensure that the full capacity of the NiMH cells is available, they should be completely discharged and then recharged at regular intervals.

3.2.3 Important note for all instruments

Help to protect our environment

The instruments contain

- one lithium battery,
- two NiMHs or two dry batteries.

The batteries contain heavy metals which may represent an environmental hazard when they are disposed of at the end of their useful life or when the instrument is scrapped. Dispose of the batteries by returning them to the appropriate collection point for used batteries, or to a company specializing in the recycling of such items, or to the place where new batteries are purchased.
Batteries purchased from Acterna can be returned to your nearest Acterna service center.

Removing the lithium battery before scrapping the instrument

The following tells you how to remove the lithium battery from the instrument.

1. Unscrew the lower enclosure shell.
2. Remove the chassis from the upper enclosure shell.
3. Remove the screening.
4. Hold the chassis so that you can see the display unit.
5. The lithium battery is on the left-hand side of the CPU board (2033-A2) below the display unit. Cut the connecting leads and dispose of the lithium battery as described in the section “Protecting the environment”.

3.3 Switching on the instrument

ON/OFF

This key is used to switch the instrument on or off. When the instrument is switched on a self-test is run which checks the microprocessor. The test lasts about 6 seconds. The following text is displayed when the test is in progress:

SPM-TEST

The instrument is then automatically calibrated. Calibration involves all subassemblies and lasts about 15 s. The following text is displayed when calibration is in progress:

CAL

When the "CAL" symbol disappears you can make measurements. The current setting is the same as the setting when the instrument was last switched off.

You can also call up the calibration routine during measurements.

* ENTER

CAL

It is a good idea to calibrate the instrument if changes in ambient temperatureoccur. Calibration every 30 minutes ensures that the full accuracy of the set is utilized.
This procedure does not affect the instrument settings.

When operated from dry or rechargeable batteries, the instrument switches off automatically after 15 minutes if no key is pressed to save power. This function can be disabled by pressing:

PERM.ON

The instrument will now remain on permanently. The message “PERM.ON” is marked at the top left of the display. Permanent on mode also operates when the instrument is powered from the AC line; in this case, “PERM.ON” is not marked.

If fitted, the NiMH batteries are recharged in the instrument by repeating the key sequence [*] and [ON/OFF] (see page 3-7).
If these keys are pressed yet again, this disables both charging mode and “PERM.ON” mode.

The function is also cleared by switching the instrument off and then on again.

If the power supply to the instrument is interrupted whilst it is switched on, the following messages are displayed briefly during the test phase:

Default setting

and

SETUPS cleared

If these two messages appear constantly after switching on, it is possible that the memory module has become damaged or the lithium battery is exhausted. In such cases, contact your local Acterna Service center for assistance.

When “Default setting” and “Setups cleared” have been displayed, the instrument will be set to its default settings (see (see section 3.4 on page 3-13). Any stored instrument setups have been cleared.

If the power supply fails while the instrument is switched on, it is possible that the software may crash and the instrument will not switch back on when the power is restored. To clear this condition, perform a “hardware reset” by pressing the [ON/OFF] and [CLEAR] keys simultaneously. The self-test will be triggered by this (see page 3-10).

3.4 Default settings (reset)

The instrument can be set to the default settings at any time by pressing

ON/OFF CLEAR

simultaneously to perform a “hardware reset”.

The message “**Default setting**” appears during the self-test and the stored instrument settings are retained.

Default settings:

– Selective level measurement
– Tuning frequency = 8 kHz.
– Bandwidth 3.1 kHz
– Output impedance = 75 Ω unbalanced (UNBAL).

3.5 Electromagnetic compatibility

This instrument meets the requirements of EN 50081-1 and is within Limit Class B of EN 55022 (identical with CISPR 22:1985 and DIN VDE 0878 Part 3).

The instrument has been tested to ensure that the EMI/RFI emission requirements are also met when it is used as part of a system.

For this condition to be met, the system must be correctly assembled and the appropriate connecting cables used. Adequate screening must be provided.

If the device under test connected to this instrument can itself emit electromagnetic interference, users must ensure that emissions remain within permitted limits. Suitable measures should be taken to ensure that screening is contiguous.

When used in a balanced system, the device under test itself must be adequately balanced.

Electromagnetic emissions can be further reduced by operating the instrument from dry or rechargeable batteries, particularly if high signal levels are involved.

3.6 Cleaning the instrument

If the instrument has become dirty through use, it can be cleaned using a soft cloth moistened with a mild solution of detergent. Make sure that the cleaning solution does not get inside the instrument. Parts which have become very dirty may also be cleaned carefully using alcohol.

4 OPERATION

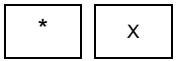
4.1 Overview

4.1.1 Connectors and keys

Explanation of symbols used:

"X" ....

Description of the function selected when [X] is pressed.



"Y" ...

Description of function Y which is selected when the key sequence [*] (shift) [X] is entered.

Inputs

⊙ Coaxial input, 75 Ω or high impedance (∞)

○○○ [1] Balanced input, 75 Ω, 150 Ω, 600 Ω or high impedance (∞). (Different versions of the instrument fitted with 120, 124, 135 or 140 Ω are available)

The input is selected automatically when the input impedance (Z) is selected (see "Z/Ω")

1) ⚠ + 30 dBm input distruction limit see section 4.2.2

Shift key (yellow)

- When a key sequence having the form [*][X] is entered, the function in yellow lettering below [X] is selected.
- When the shift key is pressed, a star flashes in the top line of the display.
- If you press the shift key by mistake, you can cancel the entry by pressing [CLEAR].

POWER

For switching the instrument on or off. If no keystroke is entered for 15 min, the instrument switches itself off automatically (when battery powered).

PERM.ON, CHARGE: Each time this key sequence is entered, the following sequence of functions is selected:

- PERM.ON. Permanent operation
- Charge mode on (14 hours)
- Both modes disabled
- Permanent operation etc.

FREQ

TUNE

To enter a new frequency press [TUNE] then:

- Enter the frequency using the number keys (entry taken as kHz) and terminate with [ENTER]
- The frequency can be entered in steps using the four up / down keys (coarse, fine); the step widths are fixed.

* TUNE
AFC

Selects or cancels AFC. No effect when [DEMOD], [WIDE] or [MAX.HOLD] have been selected.

SEARCH

To start frequency search, press [SEARCH]:

- search starts at tuning frequency
  - Increase frequency by pressing [↑] or [↑↑]
  - Decrease frequency by pressing [↓] or [↓↓]
- The search stops
  - when the result > REF or
  - when the upper or lower frequency limit has been reached
- The search can be stopped by pressing: [TUNE] or [STEP]

(The search function cannot be selected if DEMOD, WIDE or MAX.HOLD have been selected.)

STEP

To enter a new frequency or to alter the frequency press [STEP] then:

- Enter the frequency using the number keys (entry taken as kHz), terminate with [ENTER].
- The frequency can be incremented or decremented by means of the 4 up / down keys, the stepwidth is ΔF. ΔF can be set to any integer frequency value between 0 Hz and 620 kHz[1], 2 MHz[2] or 3.5 MHz[3].

* STEP
ΔF

By entering this key sequence (ΔF) you can alter the stepwidth:

- Enter ΔF (kHz) using the number keys and terminate with [ENTER]
- The up / down keys can also be used to alter ΔF.

1 SPM-32A
2 SPM-33A/-34A/-35A
3 SPM-36A

MODE

Displays the absolute level in dB or dBm. Toggle between dB and dBm "dB/dBm" by entering the key sequence [*], [-].

"REF", using this key sequence you can alter the reference level (-120 dB to +20 dB):

- Enter value using the number keys, terminate entry with [ENTER]
- The up / down keys can be used to increment or decrement "REF".

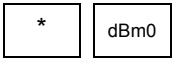
Shows the difference between the measured level (dB/dBm) and the stored reference level "REF".

"ABS--->REF": by entering this key sequence, the measured absolute level is stored as the new reference level.

Displays the "reduced level" in dB0 or dBm0. The absolute level is reduced by the relative level (dBr).

dB0 = dB - dBr
dBm0 = dBm - dBr

The relative level can be entered by pressing [*] [dBm0]



"REL (dBr)": allows you to modify the relative level.

- Enter value using the number keys and terminate with [ENTER].

- "REL" can be incremented or decremented using the up / down keys.

DEMOD

Demodulates single sideband signals. You can toggle between LSB and USB demodulation by pressing this key. The built-in loudspeaker can be used to listen to the demodulated signal.

- It is a good idea to select the 3.1 kHz filter and to tune to the centre of the bandwidth
- The volume can be adjusted with the up / down keys.

* DEMOD
MAX.HOLD

"MAX.HOLD": displays the max. level reached by keyed signals (carrier telegraphy)

SCALE

* 7
EXPAND

"EXPAND": expands bargraph display: 1 dB/div, 0.1 dB/DOT (on/off). Non-expanded display 10 dB/div, 1 dB/ DOT.

* 8
AVRG

"AVRG": result averaging (slow) on/off, resolution 0.01 dB.

CLEAR

- Clears any entry which has not been terminated with [ENTER]
- Cancels the shift key, [*]

BANDW/Hz

Bandwidth setting shown for SPM-34A as example; the bandwidths implemented in each device or option are listed in sections 5.5 and 4.2.4

WIDE	Broadband measurement over entire frequency range.
* 4 (25)	Selective measurement at 25 Hz bandwidth.
* 6 (100/200)	Selective measurement; the bandwidth alternates between 100 Hz and 200 Hz.
* 6 (400/1200)	Selective measurement; the bandwidth alternates between 400 Hz[1] and 1200 Hz.
* WIDE (3.1 kHz)	Selective measurement at 3.1 kHz bandwidth.

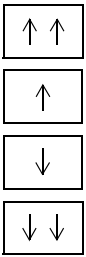
1 300 Hz also available as option for SPM-34.

Z/Ω

* 1 (75)	The input impedance, Z, = 75 Ω
* 2 (150)	The input impedance, Z, = 150 Ω (or 120, 124, 135 or 140 Ω depending on the version)
* 3 (600)	The input impedance, Z, = 600 Ω

INPUT

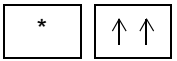
Z/∞	Toggles between the selected input impedance Z and high input impedance (∞)
* Z/∞ (BAL/UNBAL)	This key sequence toggles between the balanced (BAL) and the coaxial input (UNBAL).
* 0 (TEST & CONFIG)	"TEST & CONFIG": This key sequence calls up the test and service programs (see service manual). The software version and the options fitted are shown in the display. Press [CLEAR] or [*] to exit this mode (takes a few seconds) or switch the instrument off and then on again.
ENTER	For terminating entries.
* ENTER (CAL)	"CAL": calls up the calibration routine



Using the up / down keys, you can increase or decrease the frequency, the level, the loudspeaker volume or the address number in steps. If you hold any of the keys down, the repeat function is activated.

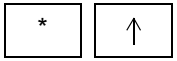
- [TUNE]: Increases or decreases the tuning frequency. The coarse step width depends on bandwidth, the fine step width is 1 Hz.
- SEARCH]: Starts the search function.
- [STEP]: Increases or decreases the tuning frequency by ΔF (adjustable step-width). ΔF is entered by entering the key sequence [*], [STEP].
- After the key sequence [*], [STEP] has been entered, ΔF can be increased or decreased in steps of 10 Hz or 1 Hz.
- After the key sequence [*], [ABS] (=REF) has been entered, the stored reference level can be incremented or decremented by 1 dB or 0.1 dB.

- After the key sequence [*], [dBm0] (="REL(dBr)") has been entered, the stored reference level can be incremented or decremented by 1 dBr or 0.1 dB.
- [DEMOD]: increases or decreases the volume in steps of 6 dB (or 2dB)
- [MEM]: the address number is increased or decreased by 5 or 1.



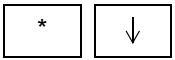
RCL MEM

"RCL MEM": for recalling setups. The address which was last set is displayed initially. The address number can then be entered (0 to 99), or altered with the up / down keys; the entry is terminated with [ENTER8].



STO MEM

"STO MEM":stores the current setup and result at an address between 0 and 99 (see RCL MEM).



DISPLAY MEM

"DISPLAY MEM": displays a setup that has been stored. The last value that was measured before the setup was stored is also displayed. It is not possible to make measurements when the setup is being displayed. The display is cleared by pressing [*], [↓↓] or any key in the FREQ or MODE groups. For more on addresses see "RCL MEM".

MEM OFF

"MEM OFF": Cancels the memory mode, addresses are no longer displayed.

4.1.2 Display

The instrument's display is divided into 4 rows and 16 columns. Various device parameters are marked around the edge of the display; squares in the display indicate which parameters have been selected.

In this manual, the rows will be designated by the letters A to D and the columns with the numbers 1 to 16. (B/15) means the character in the 2nd row and 15th column.

- Row A shows
  - The measured level when [ABS], [ABS-REF], [dBm0] or [MAX.HOLD] are entered
  - USB or LSB when [DEMOD] is entered
- Row B shows
  - The result as a bargraph (coarse)
  - "MAX.HOLD" when [*][DEMOD] (max level) is selected
  - "FREE" if there is nothing stored at the address when DISPLAY MEM is entered
- Row C shows
  - The receive frequency when [TUNE], [SEARCH] or [STEP] are pressed
  - "WIDEBAND" when [WIDE]is pressed
- Row D shows
  - The reference level when [REF] is pressed
  - The relative level when [REL(dBr)] is pressed
  - Various symbols and the address in memory mode

Meaning of symbols

* (flashes)	(A2), the yellow shift key has been pressed. Clear with [CLEAR].
--->	The value indicated by the arrow may be altered. The arrow flashes when an entry has been started but not terminated.
! (briefly)	(D2), when [*], [ABS-REF] is pressed, the measured level is stored as the reference level. (D13), storing (STO) or recalling (RCL) a set-up
?	(A2), the input level is too high, or (when wide-band measurements are being made) too low.
---> Δ	(C2,3), when the key sequence [*], [STEP] is entered you can change the frequency stepwidth by Δf.
S	(C3), when you press [STEP], the tuning frequency can be incremented or decremented by Δf.
▲ ▼	(C3), when [SEARCH] has been pressed, search mode has been selected but not started.
▼	(C3), [SEARCH] and then [↑] have been pressed; starts the search, the frequency is increasing.

▼	C3), [SEARCH] and then [↓] have been pressed; starts the search, the frequency is decreasing.
BATTERY?	(D), the battery voltage is too low (see section 3.2.2 on page 3-3)
BATT.? POWER?	(D), the errors indicated by "BATTERY?" and "POWER?" have both occurred.
CAL	(A), the instrument is being calibrated (after switch-on or after pressing [*][ENTER].
DEM.LOWER SB	(A), when [DEMOD] is pressed twice the LSB of the CF signal is demodulated and output via the built-in loudspeaker.
DEM.UPPER SB	(A), when [DEMOD] is pressed, the USB of the CF signal is demodulated and output via the built-in loudspeaker.
DSP	(D14), when [*] and [↓] are pressed, "DSP" and an address are displayed alternately. The memory contents at this address are shown but the instrument is not set to this setup.
MAX.HOLD	(B), when [*] and [DEMOD] is pressed, the rms level of a keyed carrier frequency telegraphy signal is shown.
LINE POWER?	(D), the instrument has been set to the charge mode. The voltage delivered by the charger is however too low.

STO	(D14.), appears after [*] and [↑] have been entered; "STO" and an address are displayed alternately. By pressing [ENTER] you can store the current setup and result at the address shown in the display.
WIDEBAND	(C), appears when [WIDE] is pressed. Measurements are performed using the wideband receiver.

Display marker (❑)

This marker is used to indicate which function has been selected; the possibilities are marked on the right- and left-hand edges of the display.

AFC	
AVRG	Display averaging (slow); the resolution of the level display is 0.01 dB.
BW	Shows which bandwidth has been selected.
CHARGE	Batteries are charging
EXPAND	Bargraph is expanded
INPUT:U	Either 75 Ω, 150 Ω or 600 Ω has been selected as input impedance
INPUT: ∞	High input impedance[1]
INPUT: BAL	The balanced input has been selected
PERM.ON	The auto-off function is disabled

1 The simultaneously marked impedance value is needed during dBm display for power computation.

4.2 Operation and features

4.2.1 Operating modes

The instrument has 3 operating modes:

- Selective level measurements (indicated by "meas." in table 4-1)
- Demodulating SSB signals; monitored using the built-in loudspeaker (indicated by "monitor" in table 4-1).
- Wideband level measurements

Table 4-1 is a summary of the functions in each operating mode.

Function (selected using keypad)	Wideband receiver	Selective receiver	
		Meas.	Monitor
Wideband meas.	WIDE		
Receive frequency		TUNE, STEP	
Search		SEARCH	
AFC		AFC	
Level reference	ABS, ABS-REF, dBm0		
Bandwidths		(see section 4.2.4 on page 4-39)	
Demodulation			DEMOD

Table 4-1 Summary of instrument functions

4.2.1.1 Selective level measurements

To set the instrument for selective measurements:

- Select input and input impedance:
  Use the key in the group marked "Z/Ω" and the shift key:
  [*] [1], [*] [2] or [*] [3]
  ---> (see section 4.2.2 on page 4-22)
- Set the receive frequency:
  Use [TUNE], [STEP] or [SEARCH] (frequency search)
  ---> (see section 4.2.2 on page 4-22)
- Absolute voltage level/power level, level difference or level in dBm0:
  Use [ABS], [ABS-REF] or [dBm0]
  ---> (see section 4.2.5 on page 4-46)
- Select one of the bandwidths:
  Use the keys in the group marked "BANDW/Hz" and the shift key: [*] [4], [*] [5] or [*] [6]
  ---> (see section 4.2.4 on page 4-39)

Reading the display in selective level mode

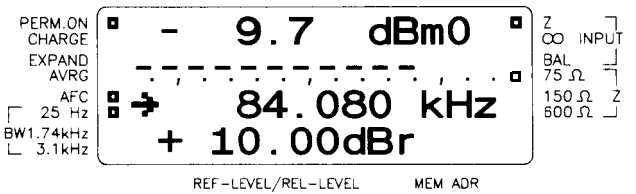


Fig. 4-1 Typical selective display.

- If necessary, select the expanded bargraph and the averaging facility.
  Use the keys in the group marked "SCALE" and the shift key: [*] [7] or [*] [8]
  ---> (see section 4.2.6 on page 4-56)

Row A: Level (rms)
Row B: Bargraph
Row C: Receiver frequency
Row D: Relative level, reference level or memory function (otherwise this row is blank)

- If no result is displayed, press [ABS], [ABS-REF] or [dBm0] (see section 4.2.5 on page 4-46)
- You cannot change the frequency shown in row C unless a flashing arrow appears before the entry; press [TUNE] or [STEP]
- If a "?" appears to the right of the level, the level is out of range.
- To check the total level, select the wideband receiver by pressing [WIDE]. Return to the selective mode by pressing [TUNE] or [STEP]; the bandwidth is automatically set to 3.1 kHz.
  – You can select any of the other two bandwidths, e.g.: 25 Hz (100 Hz) by entering [*] and [4]
- To demodulate a signal so that you can hear it, press [DEMOD]. Return to level display by pressing [ABS], [ABS-IREF] or [dBm0]

4.2.1.2 Wideband measurements

To set the instrument to measure levels with the wideband receiver:

- Select the input and the input impedance:
  Use the keys in the group marked "Z/Ω" and the shift key:
  [*] [1], [*] [2] or [*] [3]
  ---> (see section 4.2.2 on page 4-22)
- Select the wideband receiver by pressing [WIDE].
  "WIDEBAND" appears in the 3rd row of the display.
- Select absolute voltage level/power, level difference or level in dBm0:
  Use [ABS], [ABS-REF] or [dBm0]
  --->(see section 4.2.5 on page 4-46)
- If necessary, select expanded bargraph and the averaging facility:
  Use the keys in the group marked "SCALE": [*] [7] or [*] [8]
  ---> (see section 4.2.6 on page 4-56)

Reading the display in wideband mode

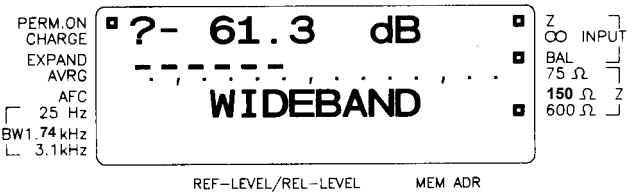


Fig. 4-2 Wideband mode display; the "?" in row A indicates that the input level is too low (in this case the input is open-circuited)

Row A: Level (input open-circuit)
Row B: Bargraph
Row C: "WIDEBAND"
Row D: Relative level, reference level or memory function (or blank)

- The mean value is measured. The result shown is, however, the rms value of a sinusoidal signal with the same frequency.
- If no result is displayed, press [ABS], [ABS-REF] or [dBm0] (see section 4.2.5 on page 4-46).
- "?" to the left of the result means
  - level out of range

4.2.1.3 SSB demodulation (DEMOD)

The instrument can demodulate SSB signals. The signals can be monitored but cannot be measured. Telephone channels in the CF range are demodulated to the AF range (0.3 to 3.4 kHz), provided the instrument is tuned to the centre of the channel

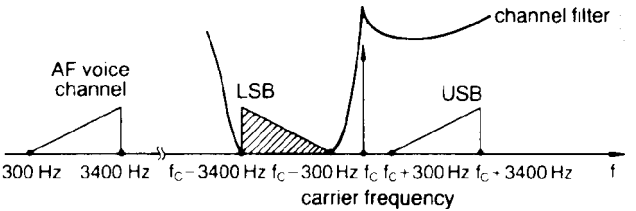


Fig. 4-3 SSB demodulation. The carrier and the USB have been suppressed.

Setting the instrument:

- Select the input and the input impedance:
  Use the keys in the group marked "Z/Ω" and shift: [*] [1], [*] [2] or [*] [3]
  ---> (see section 4.2.2 on page 4-22)
- Change the receive frequency:
  Use [TUNE] or [STEP]
  ---> (see section 4.2.3 on page 4-26)

  The centre of the band is converted to 2 kHz, provided the instrument has been tuned to the centre of the channel. If the instrument has been tuned to the suppressed carrier, the receive frequency must be de-

tuned to give correct reception. The correct offsets are given below:
LOWER SB -2 kHz
UPPER SB +2 kHz

- Select the sideband:
  By pressing [DEMOD] you can toggle between the LSB and USB (display "UPPER SB", "LOWER SB").
- Select the 3.1 kHz bandwidth
  Press [*] and [6]
  ---> (see section 4.2.4 on page 4-39)
- Adjust the volume using the up / down keys:
  – Volume up with [↑] or [↑↑] in 2 or 6 dB steps
  – Volume down with [↓] or [↓↓] in 2 or 6 dB steps.

The loudspeaker volume can only be set if the displayed mode line "DEM. UPPER SB" is marked by an arrow. If no arrow is displayed press [DEMOD] once or twice.

The frequency can be fine tuned by means of the up / down keys, [TUNE] or [STEP]

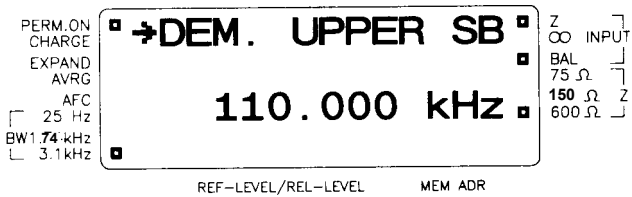


Fig. 4-4 Example showing the setting for single sideband demodulation. The instrument is receiving the USB.

4.2.2 Inputs, input impedances (Z/Ω)

Note: The instrument has various input impedance options; the 150 Ω input impedance can be replaced by impedances of 120, 124, or 140 Ω. The following deals with the 150 Ω version of the instrument, but applies in principle to the other versions.

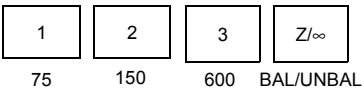
With the instrument you have the choice of 2 selectable inputs:

- Coaxial input:
  Input impedances: 75 Ω or ∞ (> 6.5 kΩ).
- Balanced input
  Input impedances: 75 Ω, 150 Ω, 600 Ω or ∞ (>13 kΩ).

Only one input should be selected at any one time

»WARNING ⚠ +30 dBm«
The input level (a.c+d.c)
must not exceed
1W or **+30 dBm**
Max. d.c. input voltage=
60 V
from $Z_{out} \geq 600\ \Omega$

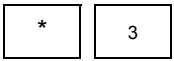
Selecting the input and the input impedance



The input and the input impedance are selected together:

– 75 Ω: coaxial input
– 150 or 600 Ω: balanced input (BAL).

Example: input impedance of 600 Ω/balanced input:

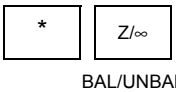


A small square next to the lettering on the right-hand edge of the display shows which input impedance has been selected. A small square is also displayed next to "BAL".

Normally the input type and the input impedance are selected together. It is possible to select them separately.

The coaxial input can thus have an input impedance of 150 Ω or 600 Ω. This should not be done at high frequencies as errors greater than those stated in the specifications will be introduced.

You can select the other input type by entering:



The input impedance remains the same.

The balanced input has been selected when a small square appears next to "BAL". If there is no square the coaxial input has been selected.

The following key is use to select the input impedance (75, 150, 600 Ω or "∞")

Z/∞

When this key is pressed the ohmic part of the input impedance is disconnected from the input connector leaving only the high impedance of the input amplifier (> 6.5 kΩ or >13 kΩ resp.)

A small square at the right-hand edge of the display shows whether "Z" or "∞" has been selected.

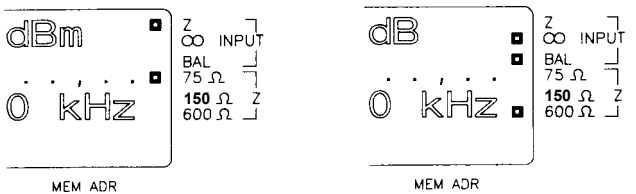


Fig. 4-5 Examples illustrating input selection

Left: Coaxial input, Z_{in} = 75 Ω

Right: Balanced input, high impedance (∞)[1]

1 The simultaneously marked impedance value is needed during dBm display for power computation. During dB display, it is irrelevant.

Voltage levels and power levels

Voltage levels (dB) are referred to a voltage of 0.775 V (1 mW into 600 Ω). For this reason, the level does not change when measurements are made using a generator with an output impedance of 0 Ω and various input impedances are selected.

Power levels (dBm) are referred to 1mW. When a different input impedance is selected a different level will be displayed by the instrument.

Z/Ω	50	75	124	135	140	150	600
L_p/dBm	10.8	9.03	6.85	6.48	6.32	6.02	0

Table 4-2 Power levels for 0.775 V into Z_{in}

Z/ Ω	50	75	124	135	140	150	600
V_z /V	0.223	0.274	0.352	0.367	0.374	0.387	0.775

Table 4-3 Voltage for 0 dBm into Z_{in} (P = 1 mW)

4.2.3 Receive frequency (FREQ)

The three keys in the group marked "FREQ" are used to select the receive frequency of the selective receiver manually or automatically.

TUNE	The receive frequency can be entered using the number keys or in steps (coarse/fine) using the up/down keys.
AFC	AFC automatically adjusts the receive frequency to the frequency of the input signal.
SEARCH	Using this facility you can automatically search for signals in a certain frequency range that exceed a certain level threshold
STEP	For changing the receive frequency using the number keys or in steps using the up / down keys (step width ΔF). The step widths for the "TUNE"function are fixed, but "STEP" can be used to set a step width ΔF between 0 and 620 kHz[1], 2 MHz[2] or 3.5 MHz[3].
ΔF	"ΔF": for entering the stepwidth when STEP mode has been selected.

1 SPM-32A
2 SPM-33A/-34A/-35A
3 SPM-36A

4.2.3.1 Frequency entry (TUNE: keypad or steps)

The selective receiver is selected by pressing:

TUNE

The receive frequency can be set in the following ways:

- Numerical entry using the number keys
- In steps using the up / down keys

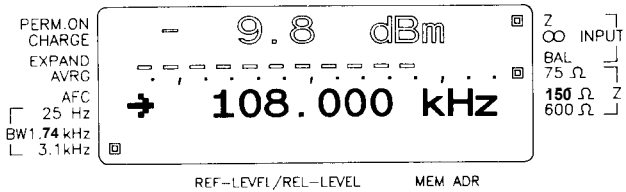


Fig. 4-6 Typical display in TUNE mode

Entering a frequency using the number keys

Example: 1.2345 MHz:

1	2	3	4	.	5	ENTER

Note: When you enter a number, the instrument always takes it to be in kHz

Changing the frequency using the up / down keys SPM-32A/-33A/-34A/-36A:

Frequency is incremented by 10, 100 or 200 Hz (depends on bandwidth)

Frequency is increased by 1 Hz

Frequency is decreased by 1 Hz

Frequency is decreased by 10, 100 or 200 Hz (depends on bandwidth)

- The repeat function comes into effect if you hold down any of the up / down keys. The step width for keys marked with one arrow is increased to 10 Hz when a bandwidth >25 (100) Hz is selected.
- When TUNE mode has been selected, the up / down keys are a good way of fine tuning the instrument.

SPM-35A:

Bandwidth/Hz	Step width/Hz	
	↑ ↓	↑↑ ↓↓
5	1	2
25, 100, 200, 400	1	10
3.1 kHz	1	200

Table 4-4 Changing the frequency in steps

If you hold the keys down, the frequency will change in steps automatically. With the single arrow keys, the step size is then 10 Hz instead of 1 Hz.

4.2.3.2 Frequency entry (STEP: keypad, adjustable step width)

The selective receiver is selected when the following key is pressed.

STEP

The receive frequency can be altered in the following ways:

– Numerical entry using the number keys (like TUNE).
– In steps of ΔF using the up / down keys. The step width, ΔF, can be adjusted.

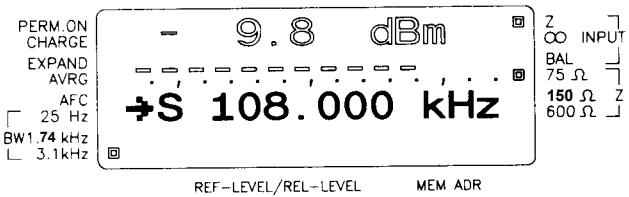


Fig. 4-7 Typical STEP mode display

Numerical frequency entry

Example: 1.2345 MHz:

1	2	3	4	.	5	ENTER

Always enter the frequency in kHz.

Frequency steps

By pressing

↑	or	↑ ↑	the frequency is increased by ΔF

By pressing

↓	or	↓ ↓	the frequency is decreased by ΔF

The previously stored value will be used unless altered.

Changing the step width ΔF

"Change step width mode" is selected by entering

*	STEP
	ΔF

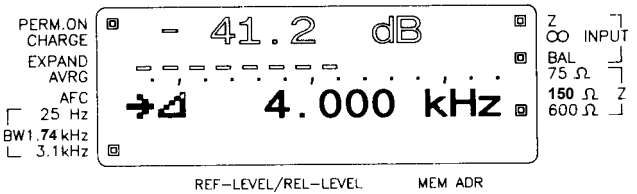


Fig. 4-8 Typical display before the entry of a new step width (ΔF). For new entry press [*] [STEP]

ΔF can now be changed

– using the up / down keys in steps of 1 Hz or 10 Hz, or
– by entering another value, e.g. 2.5 kHz:

2	.	5	ENTER		STEP

Always enter the frequency in kHz.

When you press STEP, the instrument will start to measure; the receive frequency can be incremented or decremented by the new frequency step.

4.2.3.3 SEARCH

When SEARCH mode is selected, the instrument searches automatically for signals that are greater than a set threshold value (adjustable). The receive frequency can be increased or decreased starting from a selectable initial frequency.

The AFC function ensures that the instrument remains tuned to the first signal it encounters. If no signal is found the search will end at one or other of the frequency limits.

Unless the wideband level of a signal (measured with wideband receiver, WIDE) is not more than 60 dB above the reference level (40 dB for a bandwidth of 25 Hz (100 Hz), it will not be found).

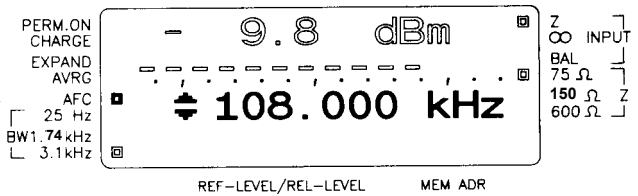


Fig. 4-9 A typical search display.

Start frequency: Equal to the current receive frequency. It can be entered as described in 4.2.3.1 (TUNE) and 4.2.3.2 (STEP).

Threshold: The current value can be used or a new value can be entered. Default setting -20 dB or dBm.

Example: Setting a threshold level of -50 dB/dBm:

*	SEARCH

THRESHOLD

—	5	0	ENTER

Even when measuring voltages, the threshold is entered in “dB” or “dBm”, depending on which unit was selected prior to switching over to voltage measurement.

The input value, converted to a voltage, is displayed in line A also.

(**Caution**: For “dBm”, the proper impedance value must be selected beforehand!).

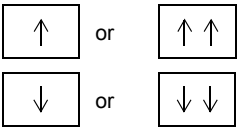
Fig. 4-10 Voltage mode display of threshold level, threshold set in dB and mV.

Fig. 4-11 Voltage mode display of threshold level, threshold set in dBm and mV

Activate SEARCH

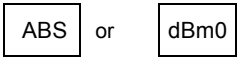
- Select SEARCH:

- Start SEARCH:

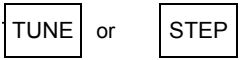


The direction of the search is indicated by an arrow in front of the current frequency in the display. The search direction can be reversed during a search if required.

- Pausing in the search:

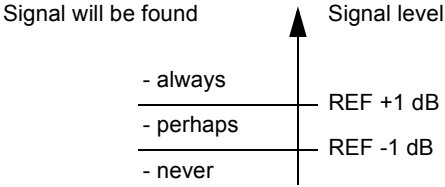


- End the search:



Further information

- AFC is activated automatically.
- The uncertainty in the comparison of the signal level and the THRESHOLD value is ± 1 dB



- The search speed depends on the filter bandwidth and on whether the display averaging function has been activated ([AVRG] key).

Bandwidth	[AVRG]	
	On	Off
5 Hz	8 Hz/s	50 Hz/s
25 Hz	40 Hz/s	250 Hz/s
100 Hz	150 Hz/s	1.4 kHz/s
200 Hz	300 Hz/s	2.9 kHz/s
300 Hz	450 Hz/s	4.4 kHz/s
400 Hz	600 Hz/s	6.0 kHz/s
1.2 kHz	1.8 kHz/s	36 kHz/s
1.74 kHz	2.6 kHz	50 kHz/s
3.1 kHz	4.6 kHz/s	100 kHz/s

Table 4-5 Search speeds as a function of bandwidth

4.2.3.4 AFC

The AFC function adjusts the receive frequency to the input frequency. AFC only comes into operation when selective measurements are being made and will only function properly if there is a discrete signal of sufficient amplitude in the passband of the selected filter.

AFC cannot be used if DEMOD mode has been selected

It is a good idea to activate AFC if

– you want to quickly tune the receiver to the centre of the filter,
– the signal frequency is fluctuating, or
– you want to monitor a signal for a long time

AFC operating range

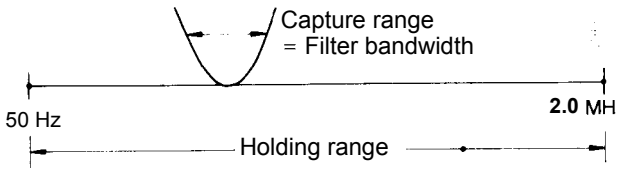
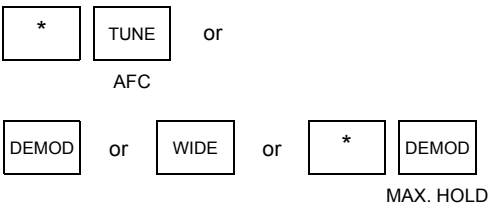


Fig. 4-12 AFC capture and holding range, e g. SPM-33A

Switching on AFC

- Tune the receiver so that the frequency of the signal is within the bandwidth of the filter
- The square beside "AFC" stops flashing when the AFC locks onto a frequency and the receiver is tuned to the signal frequency
- The square beside "AFC" flashes if the AFC has not locked because the signal frequency is outside the capture range
- The AFC will not lock if:
  - the signal frequency is fluctuating rapidly or there are large jumps in the signal frequency (select a larger bandwidth)
  - the signal level is too small

Switching off AFC



4.2.4 Bandwidths

From 3 to 6 different bandwidths are provided, depending on the instrument type. The following section explains the uses and setting of the various bandwidths.

Band-width	SPM-32A	SPM-33A	SPM-34A	SPM-35A	SPM-36A
5 Hz				×	
25 Hz	×	×	×	×	×
100 Hz	×[1]	×[1]	×	×	×[1]
200 Hz			×	×	
300 Hz			×[2]		
400 Hz			×	×	
1200 Hz			×		
1.74 kHz	×	×			×
3.1 kHz	×	×	×	×	×

1 100 Hz bandwidth instead of 25 Hz (option BN 4033/00.52)
2 300 Hz bandwidth instead of 400 Hz (option BN 4033/00.24)

Table 4-6 Bandwidths

5 Hz bandwidth

The analog radio signals used to indicate the zone and to signal broadcast announcements in the ARI system (used on highways in Germany and other countries) lie very close to the 57 kHz auxiliary carrier.

These signals can be measured precisely with the 5 Hz bandwidth. This is also useful for measurement of spectral lines in the new digital radio data system (RDS).

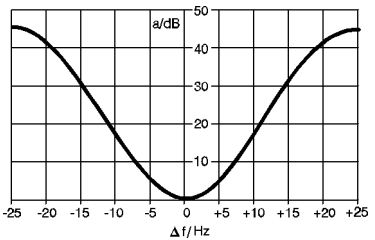


Fig. 4-13 Typical receiver selectivity at a bandwidth of 5 Hz

25 Hz bandwidth

This narrow bandwidth filter is suitable for measuring

– pilot levels or carrier leaks,
– unkeyed signals in VFT channels,
– the modulation frequency (= half transmission frequency) as a spectral line,
– interference signals inside and outside the VFT channel.

1200, 400, 200, 100 Hz bandwidths

These bandwidths are useful for measuring the rms level in a FM VFT channel to ITU-T specifications.

The level meter should be tuned to the center frequency of the VFT channel under investigation.

Nominal 3 dB bandwidth	Used for VFT system
100 Hz	FM 120
200 Hz	FM 240
400 Hz	FM 480
1200 Hz	FM 600 Bd

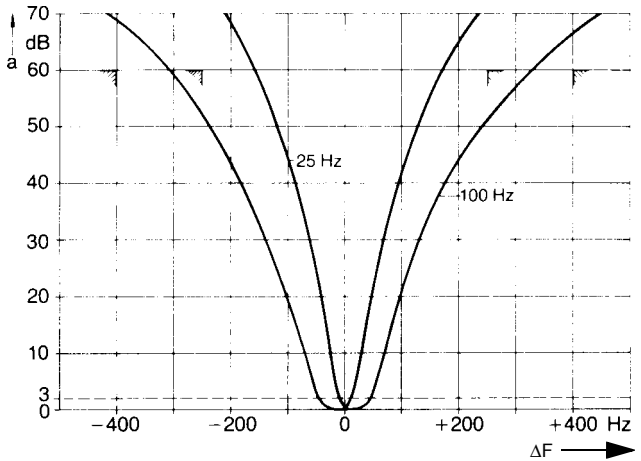


Fig. 4-14 Typical receiver selectivity for bandwidths 25 and 100 Hz

1.74 kHz bandwidth

This filter corresponds to the 3.1 kHz channel filter, but has a smaller effective noise bandwidth. It is intended for measuring weighted noise. Its noise bandwidth is the same as that of the weighting filter specified by the ITU-T-O.41 (see figure 4-15, page 4-42).

3.1 kHz bandwidth

This is the same bandwidth as a telephone channel. Using this bandwidth you can measure the power and unweighted noise carried by single telephone channels.

Warning: The 3.1 kHz and 1.74 kHz bandwidths should only be used when the receive frequency is greater than 2 kHz.

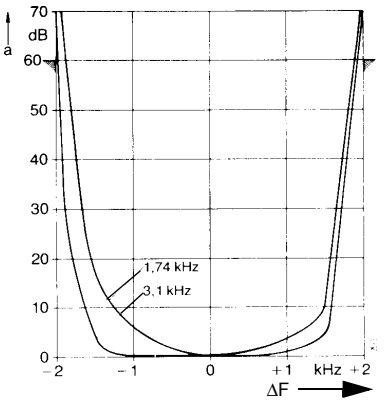


Fig. 4-15 Typical receiver selectivity for bandwidths of 1.74 kHz and 3.1 kHz

4.2.4.1 Setting the bandwidth

SPM-32A/-33A/-36A:

Note: A 100 Hz filter option for the instrument can be used to replace the 25 Hz filter (option BN 4033/00.52). The following on the 25 Hz filter applies in principle to the 100 Hz filter.

There is a choice of 3 bandwidths when the selective mode has been selected. If you are in wideband mode you can switch to selective mode by selecting one of these bandwidths (see section 4.2.1.1 on page 4-16).

4	5	6
25	1.74 k	3.1 k

To select a new bandwidth, e.g. 3.1 kHz, enter:

*	6
	3.1 k

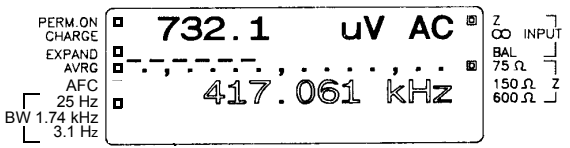


Fig. 4-16 The example shows the 25 Hz is selected

SPM-34A/-35A:

Note: A 300 Hz filter can be supplied as an option instead of the 400 Hz filter for the SPM-34A.

Indication of filter selected:

A number is shown in the lower left-hand corner of the display.

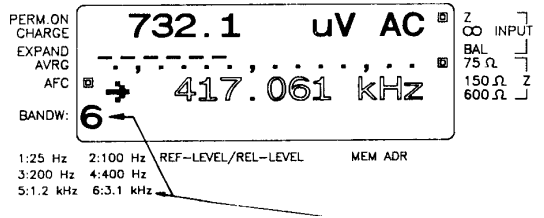


Fig. 4-17 The example shows the 3.1 kHz filter is selected

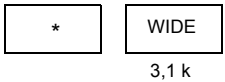
Selecting the bandwidth:

Note: Bandwidth selection is explained using the SPM-34A as an example.

The bandwidth is selected using the 4th row of keys.

4	5	6	WIDE
25	100/200	400/1200	3,1 k

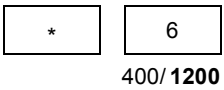
Example: Setting the 3.1 kHz bandwidth



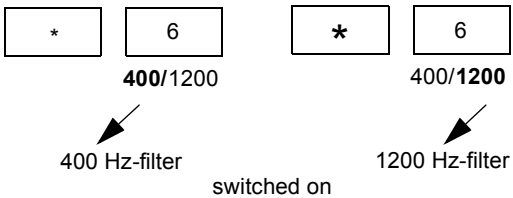
Keys [5] and [6] are assigned two filter values each. This means that to set certain values the [*] and number keys may need to be pressed twice in succession.

Example: Setting the 1200 Hz filter bandwidth

- If the current bandwidth setting is 400 Hz or 3.1 kHz, or when changing from wideband to selective reception:



- If the current bandwidth is 25, 100 or 200 Hz

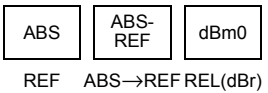


Example: Setting the 25 Hz filter bandwidth

4.2.5 Level mode

The results are displayed in terms of an absolute level or a level difference.

Levels express the ratio of two quantities. One quantity may be a reference, i.e. a certain power or a certain voltage (dBm, dB) and these are referred to as absolute levels. Relative levels are the difference between two levels.



The instrument can measure the following:

– absolute voltage and power levels (ABS)
– level differences (ABS-REF)
– level in dBm0

The following can be entered:

– reference level (REF)
– relative level (REL)

Designation	Result	Constants	Units
Absolute level	ABS		dB/dBm
Level difference[1]	ABS-REF		dB
Reference level[1] [2]		REF	dB/dBm
dBm0/dB0	dBm0 (ABS-REL)		dB0/dBm0
Relative level [1, 2]		REL (dBr)	dBr

1 No dB/dBm selection
1 Constants which are not recalculated when Constant which are not recalculated when dB/dBm switchovertakes place or when a new input impedance is selected.

Table 4-7 Level measurements

4.2.5.1 Absolute level (ABS)

The absolute level in dB is the log of the ratio of a voltage to a reference voltage (0.775 V). When this reference voltage is applied across a 600 Ω resistor a power of 1 mW is dissipated.

If a generator with an output impedance of 0 Ω is used for the measurement, the level result does not change when the input impedance of the instrument is altered.

Absolute power level (dBm) is the log of a ratio of a power to a reference power (1 mW).

When Z = 600 Ω voltage and power levels have the same numerical value.

The following can be measured,

– either the absolute power voltage level in dBmdB or
– the absolute power level in dBm after:

ABS

Selecting voltage level or power level (dB/dBm)

You can toggle between voltage level (dB) and power level (dBm) by pressing the following keys:

*	-
	dB/dBm

- When you select a new input impedance, the power dissipated is altered, thus altering the power level reading (see section 4.2.2 on page 4-22).
- The reference level (REF) and the relative level (REL) are treated as constants and so are not adjusted when a different level mode (dB/dBm) or a new input impedance are selected.

Voltage measurement

Absolute measurements can be displayed in terms of power level or voltage.

Display range

Selective measurement	1 µV to 3.8 V
Wideband Measurement	1 mV to 3.8 V

Switching from power level to voltage display

This is done by pressing

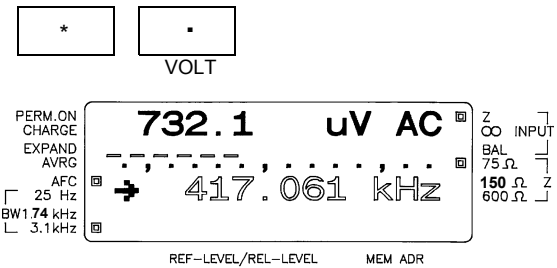


Fig. 4-18 Display of input voltage

The input voltage display is 4 digit. The instrument automatically selects the correct display units (µV, mV, V) for the measurement (e.g. 732.1 µV AC or 24.36 mV AC or 1.256 µV AC).

Only absolute measurements can be made in this mode, which is automatically selected regardless of the previous measurement mode used. It is not possible to enter a reference voltage level.

4.2.5.2 Level difference (ABS-REF), reference level (REF)

The level difference (ABS-REF) is the difference between the measured absolute level and a reference level (REF). The reference level can be entered as a constant. It is also possible to store a result and use it as the reference level. If the level mode is changed (dB/dBm) or the input impedance is changed, the reference level is not adjusted accordingly.

The level difference can be measured when the following key is pressed:

The reference level is shown in line D of the display.

Level difference (dB) = [measured absolute level (dB/dBm)] - [stored reference level (dB/dBm)].

Example:	Measured level	-16.3 dBm	(ABS)
	- Ref. level	-26.0 dBm	(REF)
	Level difference	+ 9.7 dB	(ABS-REF)

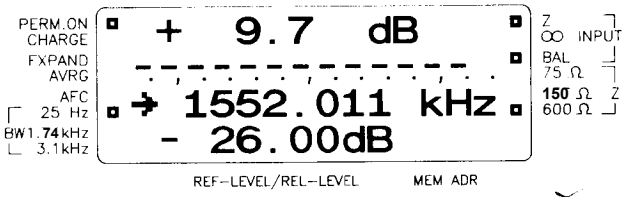


Fig. 4-19 Typical level difference display (ABS-REF); selective measurement mode has been selected. The reference level is shown in row D of the display. The reference level can be entered after pressing the key sequence [*] [ABS]. The instrument is precisely tuned to the input signal by using the up / down keys.

Reference level (REF)

When making level difference measurements the instrument refers the measured absolute level to a reference level (ABS-REF).

The reference level can be set in the following ways:

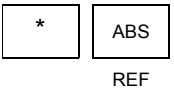
– By entering a numerical value using the number keys, or by incrementing / decrementing the level by means of the up / down keys.

– By storing a result and using it as the reference level.

Only one reference level can be defined at any one time. However, up to 100 setups (and hence up to 100 reference levels) can be stored using the "STO MEM" facility.

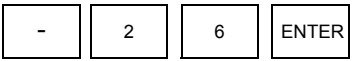
Entering the reference level as a constant

You can change the reference level after you have entered the following key sequence:



The current value of the reference level is shown in row D of the display.

You can now enter a new reference level, e.g. -26 dB:



Changing the reference level in steps:

The reference level is increased by 1 dB

The reference level is increased by 0.1 dB

The reference level is reduced by 0.1 dB

The reference level is reduced by 1 dB

Using a measured level as a reference level

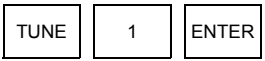
A result is stored as a reference level by entering the following key sequence:

"!" is displayed in the lower left-hand corner of the display as an acknowledgment.

Example: Attenuation of a channel filter at 4 kHz

The reference frequency is 1 kHz. The difference between the levels measured at 1 kHz and 4 kHz is to be determined.

- Tune the receiver to 1 kHz (reference frequency):



- Measure the voltage level at 1 kHz

- Store the measured level as the reference

- Tune the receiver to 4 kHz

- Measure the level difference

ABS-REF

4.2.5.3 Levels in dBm0, relative levels (REL)

Level in dBm0 = Absolute level - Level in dBr.

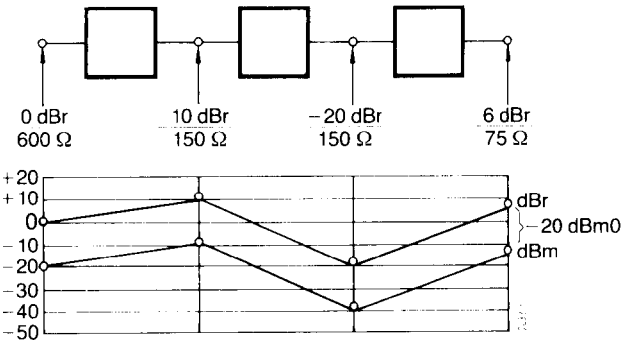


Fig. 4-20 Level plan for a transmission system

At the 0 TLP (0 dBr point) the level in dBm0 is equal to the absolute power level. For other points in the transmission system, [dBm0] = [dBm] - [dBr]. It must be ensured that the correct relative level and the correct input impedance are used for other test points.

The dBm0 mode is selected by entering:

dBm0

Level in dBm0 = Abs. level (dBm) - Stored rel. level (dBr).

Example:	Measured level	-64.5 dBm	(ABS)
	- Relative level	-15.0 dBr	(REL)
	Level in dBm0	-49.5 dBm0	

If you select "dB" instead of "dBm", the voltage level referred to a 0 dBr point is measured (dB0). The stored reference level is not adjusted when "dB" is selected.

Relative level (REL)

Unlike an absolute level, a relative level is the difference in level between any point in a transmission system and the level at a reference point. At the reference point the relative level equals 0 dB (see figure 4-20, page 4-54).

The relative level is determined by the level plan and so need not be measured. It is entered as a constant.

* ABS

REL (dBr)

- The current value of the reference level is shown in row D of the display. The relative level can be set in the same way as the reference level (see 3.2.5.2).

- The relative level can also be taken to be a relative voltage level, regardless of whether the level is displayed in dB or dBm. The numerical value is not adjusted when you switch from dB to dBm or vice versa.
- It is only possible to define one relative level at any one time. However, up to 100 setups (and hence up to 100 reference levels) can be stored using the "STO MEM" facility.

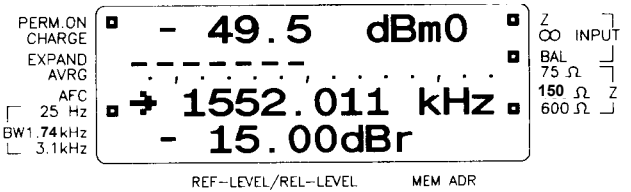


Fig. 4-21 Selective level measurement in dBm0. Row D shows the relative level in dBr(REL). It is entered by pressing [*] and [dBm0]. The receiver can be precisely tuned to the input frequency using the up / down keys.

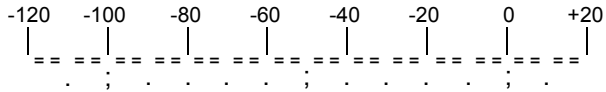
4.2.6 Bargraph, AVRG, MAX. HOLD

4.2.6.1 Bargraph

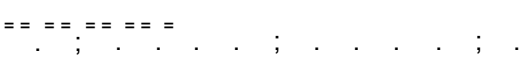
The instrument has a bargraph that has certain similarities with an analog meter. The eye can interpret changes in the length of the line more rapidly than changes in a purely digital display.

Normal scale

Scale: 10 dB (dBm) per division



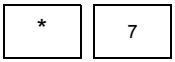
Example: Display of -75 dB (dBm):



Expanded scale

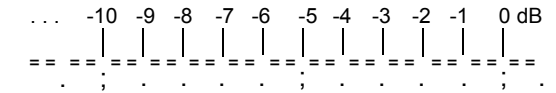
Scale: 1 dB/div.

The expanded scale can be selected or cancelled by entering the sequence:



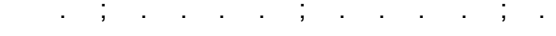
The expanded scale is a relative scale and should be thought of as folding back onto itself. The display increases or decreases by ±10 dB at -11 dB or +1 dB (hysteresis to prevent display jitter at 0 or -10 dB). In other words, only the relevant section of an expanded display is shown.

n*10 dB + ...



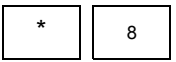
Example: Result = -23.5 dB:

-20 dB -3.5 dB



4.2.6.2 Display averaging (AVRG)

The instrument has an averaging facility for rapidly fluctuating signals. It can be switched on and off by entering the following sequence:



The averaging facility has the following effects:

– The time constant of the rectifier is increased
– The current level shown by the display is calculated using the following formula:
  Display value = (7 x old value + new value)/8
– The display resolution increases from 0.1 dB to 0.01 dB.

4.2.6.3 MAX.HOLD

This function displays the maximum rms signal level of a variable input signal detected during the measurement period. This allows you to check idle channels for intermittent interference or overvoltages, as long as the signal is present for long enough for the autorange function to operate.

Note: Do not use the MAX.HOLD function when using the SEARCH function.

The MAX.HOLD function can also be switched on and off during a measurement by pressing:

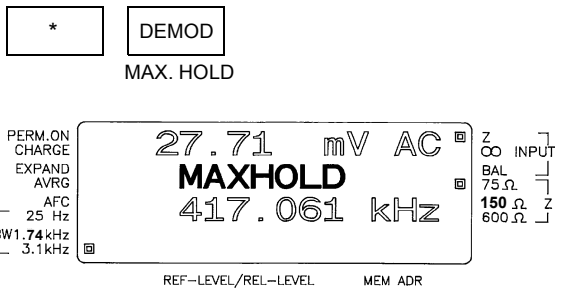
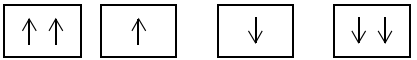


Fig. 4-22 MAX. HOLD function activated

4.2.7 Storing setups (MEMORY)

The instrument can store up to 100 complete setups which can be recalled when required. The current result is also stored when the setup is stored. As it is possible to display stored setups without using them for measurements, the memory can also be used as an electronic notebook.



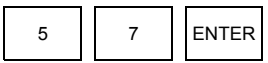
RCL MEM	Recalls stored setup
STO MEM	Stores current setup and latest result
DISPLAY MEM	Displays a setup stored in memory
MEM OFF	Cancels the current memory function

4.2.7.1 Addresses

Addresses 0 to 99 are used to store setups. One setup can be stored at each address.

When STO MEM, RCL MEM or DISPLAY MEM are selected, an address number is displayed in the lower right-hand corner of the display. The arrow to the right of the displayed address means that the address number can be altered.

- Enter the address number (e.g. 57) using the number keys



The [ENTER] key terminates the entry.

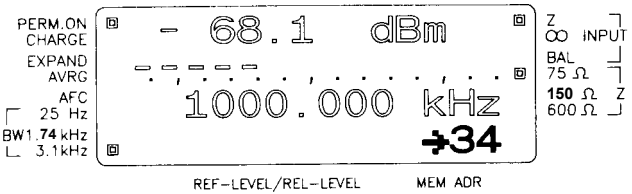


Fig. 4-23 Typical display when RCL MEM is selected. The address (in this case 34) can now be modified.

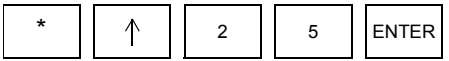
- Incrementing or decrementing the address number:

↑ ↑	Address is increased by 5
↑	Address is increased by 1
↓	Address is decreased by 1
↓ ↓	Address is decreased by 5

The repeat mode is selected if any of these keys are held down.

4.2.7.2 Storing a setup (STO)

To store a setup, e.g. at address 25:



- When STO MEM has been selected by pressing [*] and then [↑], "STO" and an address number are shown in the display (they flash on and off alternately)
- The address number can be modified using the up / down keys, or a new address can be entered using the number keys.
- When you press [ENTER], the setup and the current result are stored at the address displayed.
- Entry is acknowledged by "!STO" which appears in the lower right-hand corner of the display.
- If you store a setup at an address where a setup has already been stored, the old setup will be overwritten. You can determine beforehand whether an address is free or not by using DISPLAY MEM (see section 4.2.7.4 on page 4-67).
- To quit memory mode, press [*] and then [↓↓], (MEMORY OFF).

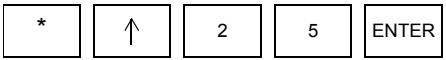
  You can also quit memory mode by pressing any function key, e.g. [TUNE] or [DEMOD].

Storing results

When a setup is stored, the current result is also stored. These results can be viewed later using the DISPLAY MEM function. In effect, the instrument can be used as an electronic notebook, which tells you the settings you have used as well as the results.

Example showing storage of three results. The initial address is 25. The setup selected is always the same. The initial address is entered using the number keys. The address number can then be incremented using the [↑] key.

1st result:



2nd result:

(address 26)

3rd result:

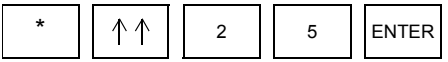
(address 27)

Quit memory mode by entering:

4.2.7.3 Recall setup (RCL)

You can recall a stored setup as often as you want from memory. When you press [ENTER] the instrument is set to the recalled setup and the measurement is started immediately.

Recalling a setup, e.g. stored at address 25



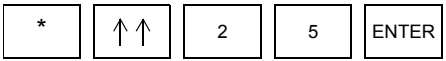
- After selecting RCL MEM mode by entering [*] and then [↑↑], an address number is displayed in the lower right-hand corner of the display.
- The address number can be modified using the up / down keys or by entering a new address number using the number keys (see section 4.2.7.1 on page 4-60).
- When [ENTER] is pressed, the instrument is set to the recalled setup and the instrument starts measuring.
- An exclamation mark to the left of the address number (e.g. "!25") acknowledges the previous procedure.
- Quit memory mode by pressing [*] and then [↓↓] "MEM OFF".
  You can also quit memory mode by pressing any other function, key, e.g. [TUNE] or [DEMOD].
- If you attempt to recall a setup from an address at which nothing has been stored, the default setup will be set (selective measurements at f = 8 kHz).

Calling up several setups

To recall a sequence of stored setups, you do not need to reselect the RCL MEM function each time.

Example: Recall three setups; starting at address is 12. The first address is entered using the number keys. This can then be modified using [↑] (increment = 1).

1st setup



RCL MEM

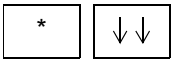
2nd setup:

(the address is increased by 1 to 13)

3rd setup:

(the address is increased by 1 to 14)

Quitting memory mode



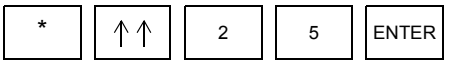
MEM OFF

Updating stored results

Stored results and setups can be updated by recalling the setup and storing it at the same address after a measurement has been made. The setup itself is unchanged. The new results can be viewed later using DISPLAY MEM.

Example: Updating results, starting at address 25:

- Recall setup at address 25:

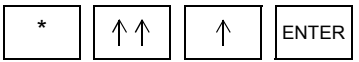


RCL MEM

- Make measurement and then re-store:

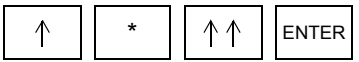
STO MEM

- Increment address by 1 and recall setup:



or

RCL MEM



RCL MEM

- and so on.

4.2.7.4 DISPLAY

Stored setups can be viewed with the DISPLAY MEM function. This gives you

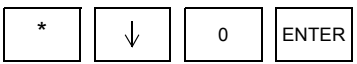
– an overview of the memory contents
– a way of reading off the results stored with the setups.

If nothing is stored at a particular address, "FREE" is shown in the display.

Fig. 4-24 DISPLAY MEM display, address is unoccupied. "DSP" and the address number flash on and off alternately.

Example: How to check what is stored at address 0:

1st setup:



DISPLAY MEM

– After you have selected DISPLAY MEM by entering [*] and then [↓], "DSP" and "0" (the address number) flash on and off alternately.
– If you alter the address number using the up / down keys, you do not need to press [ENTER] (key is disabled).

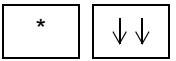
2nd setup:

(address increased by 1 to 1)

3rd setup:

(address increased by 1 to 2)

The whole memory can be examined quickly in this way. Display mode is switched off by entering:



MEM OFF

The instrument is set to the last setup and starts measuring.

4.2.8 Avoiding errors due to large common-mode voltages

Use screened cables if stray fields are present, otherwise induced interference voltages may result!

Stray fields are found in the areas surrounding high tension lines for example. Spurious signals will be induced in a twin core cable connected to the balanced input of the instrument in such cases, resulting in an incorrect measurement due to the finite common-mode rejection ratio of the input circuit.

These errors can be minimised by either

– Use a CF cable with good shielding and connect it to the test ground connection of the system under test.

5 SPECIFICATIONS

Unless otherwise stated, this data applies to the nominal ranges of use of the ambient conditions after the instrument has been calibrated.

5.1 Inputs

Coaxial input . . . . . .Versacon 9 Universal Connector
compatible with all common connector systems

Input impedance, selectable . . . . . 75 Ω, high impedance

Return loss

SPM-32A/-33A/-34A/-35A . . . . . ≥ 40 dB

SPM-36A:

50 Hz to 2 MHz . . . . . ≥ 40 dB

50 Hz to 3.5 MHz . . . . . ≥ 35 dB

Balanced input
3pole CF socket

Input impedance,
selectable . . . . . .75 Ω, 150 Ω, 600 Ω, high impedance

Return loss at f = 10 kHz . . . . . .≥40 dB

Longitudinal conversion loss (LCL) to
ITU-T Recommendation O.9

SPM-32A	> 40 dB		—			
SPM-33A/-34A/-35A			> 30 dB		—	
SPM-36A					> 25 dB	
Frequency range/Hz	50	100	620 k	1.62 M	2 M	3 M	3.5 M

Table 5-1 Longitudinal conversion loss

Maximum load for both inputs
(input signal and common mode signal)

Input level . . . . . + 30 dBm

D.C.input voltage . . . . . 60 V from $Z_{out} \geq 600\ \Omega$

5.2 Frequency

Frequency range

SPM-32A . . . . . 50 Hz to 620 kHz

SPM-33A/-34A/-35A . . . . . 50 Hz to 2 MHz

SPM-36A . . . . . 50 Hz to 3.5 MHz

Frequency setting

– Manually using keypad; resolution . . . . . 1 Hz

– Automatically using AFC

AFC tuning accuracy

SPM-32A/-33A/-36A:

at bandwidths (B) ≤100 Hz . . . . . ± 1 Hz

at B ≥ 1.74 kHz . . . . . ± 10 Hz

SPM-34A/-35A:

at B ≤ 400 Hz . . . . . ± 1 Hz

at B > 400 Hz . . . . . ± 10 Hz

AFC capture range

SPM-32A/-33A/-36A:

at B = 25 Hz . . . . . ± 50 Hz

at B = 100 Hz . . . . . .± 100 Hz

at B B ≥ 1.74 kHz . . . . . ± 1.5 kHz

SPM-34A/-35A:

at B = 5 Hz. . . . . ± 10 Hz

at B = 25 Hz . . . . . ± 50 Hz

at B = 100 Hz . . . . . ± 90 Hz

at B = 200 Hz . . . . . .± 150 Hz

at B = 300 Hz . . . . . ± 200 Hz[1]

at B = 400 Hz . . . . . .± 220 Hz

at B = 3.1 kHz . . . . . ± 1.5 kHz

SPM-34A:

at B = 1.2 kHz . . . . . .± 1,0 kHz

SPM-35A:

at B = 5 Hz . . . . . .± 10 Hz

1 Option 4033/00.24, SPM-34A

– Automatically using a single search
(The pre-settable level is threshold)

Level difference between max. signal level and response threshold:

SPM-32A/-33A/-35A/-36A:

at B $\leq$ 100 Hz . . . . . $\leq$ 40 dB

at B $\geq$ 1.74 kHz . . . . . $\leq$ 60 dB

SPM-34A/-35A:

at B = 5 Hz[1] . . . . . $\leq$ 30 dB

bei 25 Hz $\leq$ B $\leq$1.2 kHz. . . . . $\leq$ 40 dB

at B = 3.1 kHz . . . . . $\leq$ 60 dB

Frequency display

7 digit, resolution 1 Hz

Error limits

Frequency setting error limits including aging for 1 year . . . . . $\pm 3 \times 10^{-6} \times f \pm 1$ Hz

1 SPM-35A

5.3 Level measurements

5.3.1 Measured quantities

Power level (referred to 1 mW) in . . . . . dBm
Voltage level (referred to 0.775 V) in . . . . . dB
Level difference in . . . . . dB
referred to reference level (REF) in . . . . . .dBm/dB
Reduced level in dBm0, dB0
referred to relative level . . . . . dBr
Voltage in . . . . . µV, mV, V

5.3.2 Level display

Digital display, max. resolution . . . . . 0.01 dB
Quasi-analog bar graph as trend display
Scale, selectable
SPM-32A/-33A/-36A. . . . . .140 dB/10 dB
SPM-34A/-35A . . . . . 110 dB/10 dB
Resolution, expanded display . . . . . 0.1 dB

5.3.3 Display range

From noise floor to maximum measured level

SPM-32A/-33A/-36A:

Input	Selective, f ≥ 10 kHz	Wideband
Coaxial, 75 Ω	< -120 to +20 dBm	< -50 to + 20 dBm
Balanced 75 Ω to 150 Ω 600 Ω	 < -105 to +20 dBm < -110 to + 10 dBm	 < -50 to + 20 dBm < -60 to + 10 dBm
Voltage	< 8 µV to 3.8 V	1 mV to 3.8 V

Table 5-2 Noise floor (SPM-32A/-33A/-36A)

SPM-34A/-35A:

Input	Selective, f ≥ 10 kHz	Wideband
Coaxial, 75 Ω	< -90[1] to +20 dBm	< -50 to +20 dBm
Balanced 75 Ω to 150 Ω 600 Ω	 < -90[1] to +20 dBm < -100[2] to +10 dBm	 < -50 to +20 dBm < -60 to +10 dBm
Voltage	<15 µV to 3.8 V	1 mV to 3.8 V
1 for 5 Hz bandwidth <-80 dBm 2 for 5 Hz bandwidth <-90 dBm		

Table 5-3 Noise floor (SPM-34A/-35A)

5.4 Error limits of the level display

for $Z_{in} = Z_{out} = Z_0$, after calibration, with display averaging (AVRG), MAX.HOLD off, battery mode, includes rounding errors and the signal balance ratio of d.u.t. ≥20 dB

Note: The error limits for voltage measurements in dB can be converted linearly to %, 0.1 dB is approx. 1.2 % (of the measured value).

5.4.1 Intrinsic error and variation with level

at 10 kHz and (23±3)°C (table values in dB)

SPM-32A/33A/36A:

Balanced, all bandwidths		± 0.4					± 0.9	—
Coaxial	B > 100 Hz							
	B = 100 Hz	± 0.3	± 0.1	± 0.3	± 0.4			± 0.6
	B = 25 Hz				± 0.4			
Level range/dBm (75, 135, 150 Ω)		+ 20	0	0	-70	-80	-90	- 100
Level range/dB, dBm (600 Ω)		+10			-80	-90	-100	- 110

Table 5-4 Intrinsic error and variation with level (SPM-32A/-33A/-36A)

SPM-34A:

Balanced	± 0.4				± 0.9
Coaxial	± 0.3	± 0.1	± 0.3	± 0.4	

Level range/dBm (75, 135, 150 Ω)	+ 20	0	0	-60	-70	-80
Level range/dB, dBm (600 Ω)	+10			-70	-80	-90

Table 5-5 Intrinsic error and variation with level (SPM-34A)

SPM-35A:

5 Hz bandwidth

Balanced	± 0.4			± 0.5
Coaxial	± 0.3	± 0.1	± 0.3	

Level range/dBm (75, 135, 150 Ω)	+ 20	0	0	-60	-70
Level range/dB, dBm (600 Ω)	+10			-70	-80

Table 5-6 Intrinsic error and variation with level (SPM-35A)

25 Hz to 3.1 kHz bandwidths

Balanced	± 0.4				± 0.9
Coaxial	± 0.3	± 0.1	± 0.3	± 0.4	

Level range/dBm (75, 135, 150 Ω)	+ 20	0	0	-60	-70	-80
Level range/dB, dBm (600 Ω)	+10			-70	-80	-90

Table 5-7 Intrinsic error and variation with level, 25 Hz bis 3,1 kHz (SPM-35A)

5.4.2 Variation of level display with frequency

referred to 10 kHz, the input level at ≥40 dB above the intrinsic noise level

Coaxial Z=75 Ω		± 0.6	± 0.3	± 0.5	± 0.6	± 0.7	± 0.9
Balanced	Z=75 to 150 Ω		± 0.3	± 0.5	± 0.6	± 0.7	± 0.9
	Z=600 Ω		± 0.4	± 0.6	± 0.7	± 0.8	± 1.0

Frequency range/Hz	50	100	620 k	1.62 M	2 M	3 M	3.5 M

Table 5-8 Variation of level display with frequency

5.4.3 Total error

(the total of all previously listed errors)

SPM-32A/-33A/-36A:

Error limits (selective)[1]	f=200 Hz to 620 kHz	± 0.7 dB		± 1.1 dB
	f=200 Hz to 1.62 MHz	± 0.9 dB		± 1.3 dB
	f=50 Hz to 2 MHz	± 1.0 dB		± 1.4 dB
	f=50 Hz to 3 MHz	± 1.1 dB		± 1.5 dB
	f=50 Hz to 3.5 MHz	± 1.3 dB		± 1.7 dB
Error limits (wideband)[2]	f=200 Hz to 620 kHz	± 0.8 dB	—	—
	f=200 Hz to 1.62 MHz	± 1.0 dB	—	—
	f=200 Hz to 2 MHz	± 1.1 dB	—	—
	f=200 Hz to 3 MHz	± 1.2 dB	—	—
	f=200 Hz to 3.5 MHz	± 1.4 dB	—	—

Level range/dBm (75, 135, 150 Ω)	+20	-40	-80	-90[1]
Level range/dB, dBm (600 Ω)	+10	-50	-90	-100[2]

1. RMS measurement
2. Average measurement, display of rms value for sinusoidal signals

Table 5-9 Total error (SPM-32A/-33A/-36A)

SPM-34A/-35A:

Error limits (selective)[1]	f=200 Hz to 620 kHz	± 0.7	
	f=200 Hz to 1.62 MHz	± 0.9	
	f=50 Hz to 2 MHz	± 1.0	
Error limits (wideband)[2]	f=200 Hz to 620 kHz	± 0.8	—
	f=200 Hz to 1.62 MHz	± 1.0	—
	f=200 Hz to 2 MHz	± 1.1	—

Level range/dBm (75, 135, 150 Ω)	+20	-35	-75 (-60)[3]
Level range/dB, dBm (600 Ω)	+10	-45	-85 (-70)[3]

1. RMS measurement
2. Average measurement, display of rms value for sinusoidal signals
3. Values in brackets apply to 5 Hz bandwidth

Table 5-10 Total error (SPM-34A/-35A)

5.5 Selectivity, bandwidth selectable

SPM-32A/-33A/-36A:

Nominal value	Effective noise bandwidth	Bandwidth for attenuation < 3 dB	Centre frequency ±Δf for attenuation >60 dB
25 Hz	-	24 Hz	± 250 Hz
100 Hz[1]	-	80 Hz	± 400 Hz
1.74 kHz	1.74 kHz ±10%	1450 Hz	± 2 kHz
3.1 kHz	3.1 kHz ±15%	2.7 kHz	± 2 kHz
Option, replaces 25 Hz. Values for +10 to +35° C			

Table 5-11 Selectivity (SPM-32A/-33A)

SPM-34A:

3 dB bandwidth (nominal)	Attenuation at frequency offset Δf			
	≤ 0.5 dB	≤ 3 dB	≥ 17 dB	≥ 50 dB
25 Hz	—	± 12 Hz	—	± 100 Hz
100 Hz	± 25 Hz	± 45 Hz	± 100 Hz	± 350 Hz
200 Hz	± 60 Hz	± 100 Hz	± 200 Hz	± 700 Hz
400 Hz	± 120 Hz	± 200 Hz	± 400 Hz	± 1 kHz
1200 Hz	± 360 Hz	± 600 Hz	± 1200 Hz	± 2 kHz[3]
3100 Hz[1]	—	—	—	± 2 kHz[3]
1 Effective noise bandwidth 3.1 kHz ± 15 % 2 Bandwidth for attenuation ≤ 3 dB = 2.7 kHz 3 Stop-band attenuation ≥ 55 dB				

Table 5-12 Selectivity (SPM-34A)

SPM-35A:

3 dB bandwidth (nominal)	Use with VFT systems	Attenuation at frequency offset Δf			
		≤ 0.5 dB	≤ 3 dB	≥ 17 dB	≥ 50 dB
5 Hz	—	—	5 Hz[2]	± 10 Hz	± 20 Hz[3]
25 Hz	—	—	± 12 Hz	± 50 Hz	± 100 Hz
100 Hz	FM 120	± 25 Hz	± 45 Hz	± 100 Hz	± 350 Hz
200 Hz	FM 240	± 60 Hz	± 100 Hz	± 200 Hz	± 700 Hz
400 Hz	FM 480	± 120 Hz	± 200 Hz	± 400 Hz	± 1 kHz
3100 Hz[1]	—	—	± 2.7 kHz[2]	—	± 2 kHz[4]

1 Effective noise bandwidth 3.1 kHz ± 15 %
2 Bandwidth for attenuation ≤ 3 dB
3 Stop-band attenuation ≥ 55 dB
4 Stop-band attenuation ≥ 55 dB

Table 5-13 Selectivity (SPM-35A)

Image frequency and IF attenuation
for input levels ≤ 0 dBm

SPM-32A/-33A/-34A/-36A. . . . . > 60 dB

SPM-35A:

at B = 25 Hz to 3.1 kHz . . . . . ≥Š 60 dB

at B = 5 Hz . . . . . ≥Š 40 dB

5.6 Harmonic ratio a_{k2}, a_{k3}

for fundamental frequencies f ≥ 2 kHz,
input levels ≤ -10 dBm

SPM-32A/33A/-36A . . . . . > 60 dB

SPM-34A . . . . . > 55 dB

SPM-35A:

at B = 25 Hz to 3.1 kHz . . . . . ≥ 55 dB

at B = 5 Hz. . . . . ≥ 40 dB

5.7 Demodulator

Single sideband demodulation,

selectable . . . . . upper or lower sideband

Built-in loudspeaker, adjustable volume

5.8 Memory

100 setups can be stored and recalled. The setups are cleared by being overwritten.

5.9 General specifications

5.9.1 Power supply

Dry batteries . . . . . Two IEC 6LF22 or 6LR61 (built-in)

NiMH batteries . . . . . Two, e.g. Varta V7/8H (with charging contact)

(or NiCd rechargeable batteries . . . . . e.g. Varta V7/8R, Sanyo N-6PT)

Battery pack . . . . . BAZ-33 (battery pack can be removed from instrument)

AC line operation . . . . . only with LNT-2[1] (14 to 15 V, approx. 100 mA)

Measurements can be made during battery charging.

Operating time from

Dry batteries . . . . . approx. 8 h
Rechargeable batteries . . . . . approx. 2 h
BAZ-33 Battery Pack . . . . . approx. 8 h

5.9.2 Ambient conditions

Ambient temperature

Nominal range of use . . . . . 0 to + 50° C

1 see section 2:

Limits operating range . . . . . - 10 to + 55° C

Limits range, transport and storage . . . - 30 to + 70° C

Relative air humidity (to 40° C) . . . . . 5 to 95%

Not suitable for continuous operation in warm humid conditions. Occasional condensation will not affect the instrument.

Dimensions (w x h x d) in mm . . . . . 110 x 200 x 60

Weight (with batteries). . . . . approx. 1 kg

5.9.3 Electromagnetic compatibility

EMF emission . . . . . to CISPR 22 class B/EN 55022 and EN 50081-1[1]

Refer also to section 3.5

Immunity to interference. . . . . to IEC 801-2,-3,-4 and EN 50082-1[1]

5.9.4 Safety information

Safety measures . . . . . to IEC 1010-1[1]

Safety class of LNT-2 . . . . . Safety class II

Protective measures affecting connection to telephone network . . . . . to IEC Guide 105 and EN 41003[1]

1 CE conformance is based on adherence to these standards

5.10 Ordering information

SPM-32A[1](CF connector) . . . . . .BN 4033/11

SPM-32A[2] . . . . . .BN 4033/12

like BN 4033/11, but with noise measurements in dBrnC, WECO connectors

SPM-33A[1] (CF connector). . . . . .BN 4033/01

SPM-33A[2] . . . . . .BN 4033/02

like BN 4033/01, but with noise measurements in dBrnC, WECO connectors)

SPM-34A[1] (CF connector). . . . . .BN 4033/20

SPM-35A[3] (CF connector). . . . . .BN 4033/30

SPM-36A[1] (CF connector). . . . . .BN 4033/36

SPM-36A . . . . . .BN 4033/37

like BN 4033/36, but with noise measurements in dBrnC, WECO connectors [4]

---

1 All instruments are fitted with basic 75 Ω Versacon 9 connector and BNC insert. Other inserts should be ordered when ordering the instrument; see Versacon 9 data sheet for details.
The instruments are supplied with: 2 dry batteries, carry strap

2 A bandwidth of 1.95 kHz instead of 1.74 kHz

3 All instruments are fitted with basic 75 Ω Versacon 9 connector and BNC insert. Other inserts should be ordered when ordering the instrument; see Versacon 9 data sheet for details.
The instruments are supplied with: 2 dry batteries, carry strap

4 A bandwidth of 1.95 kHz instead of 1.74 kHz

Options[1]

124 Ω instead of 150 Ω . . . . . BN 4033/00.60
135 Ω instead of 150 Ω . . . . . BN 4033/00.61
140 Ω instead of 150 Ω . . . . . BN 4033/00.62

Bandwidth 100 Hz[2] instead of 25 Hz . . . . BN 4033/00.52

Bandwidth 300 Hz[3] instead of 400 Hz. . . . BN 4033/00.24

Accessories

BAZ-33 Battery Pack . . . . . BN 4033/00.10
(strap-on NiMH unit)

TR7 NiMH batteries (two required) . . . . . .BN 820/00.50
with charger contact

LNT-2 A.C. Adapter/Charger . . . . . BN 4071/90.02
Please specify power cord required:[4]
European plug. . . . . K 490
U.S./Japanese plug . . . . . K 491
U.K. plug . . . . . K 492
Australian plug . . . . . K 493

SDG-40 Balanced Attenuator . . . . . .BN 608/00.01

PLCP-40 Coaxial Attenuator . . . . . .BN 9203/01

1 To be ordered together with the instrument (can only be factory fitted)
2 SPM-32A/-33A/-36A
3 SPM-34A, BN 4033/20
4 Specify when ordering the LNT-2

Leather case no. 10 . . . . . .BN 0926/23
MK-1 Equipment Case[1] . . . . . .BN 2090/09
Balanced test adapter
for complex impedance . . . . . BN 4033/00.11

1 See MK-1 or MK-4 data sheets for details.

Index

Symbols

A

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Z